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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/854,760	05/14/2001	Xian J. Ning	01 P 7422 US 01	8925

25962 7590 06/10/2003

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EXAMINER

VINH, LAN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 06/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/854,760

Applicant(s)

NING, XIAN J

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 14 May 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 17-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Other

2) ☐ Notice of Draftsperson's Patent Drawing Review (P. 1534-6)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____

6) ☐ Other

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-16, drawn to a method, classified in class 438, subclass 691.
 - II. Claims 17-21, drawn to a semiconductor structure/product, classified in class 257, subclass 2.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make other and materially different product such as a DRAM (Dynamic Random Access Memory).
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.
5. During a telephone conversation with Kay Houston on 5/8/2003 a provisional

Affirmation of this election must be made by applicant in replying to this Office action.

Claims 17-21 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

6. In line 2 of claim 11, the term "tanelum" appears to be a typographical error. The examiner suggests replacing "tanelum" with --tantalum--.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 3-12, 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Sung et al (US 6,346,454)

Sung discloses a method of making dual damascene interconnect structure. This method comprises the steps of:

forming a first dielectric layer 32, etching a trench having a dimensions into the layer 32 (col 5, lines 33-38; fig. 2)

depositing a first layer of conductive metal 34 into the trench, forming a second dielectric layer 42 over the layer 32/first dielectric and metal layer 34 (col 41-45)

etching the openings into the dielectric layer 43/second dielectric (col 5, lines 55-57; fig. 3), which reads on etching simultaneously channels and opening into the second dielectric layer, fig. 4 of Sung shows that opening/channel 57 extending to metal layer 34 and the opening 56 extending through layer 42/second dielectric layer whereby the bottom of opening 56 is coplanar with the top surface of metal layer 34

filling the openings 56 and 57 and portion of dielectric layer 42 with conductive metal 54 by electroplating metal layer 54 (col 6, lines 15-20), which reads on filling the channels and opening with a metal and plating a remaining portion of the surface of the second dielectric layer with metal, fig. 5 of Sung shows that the metal 54 fill the opening/channel 57 and underfill opening 56

performing a CMP of the metal surface (col 6, lines 59-60)

depositing a conductive metal layer 50, metal layers 46 and 48 on the metal surface and portion of dielectric layer 42/second dielectric layer (col 6, lines 45-49; fig. 7 of Sung shows that layers 50, 46 and 48 conforms to the surface of the underfilled opening 56), which reads on depositing a non-transparent stack of layers onto the metal and the remaining portions of a top surface of the second dielectric layer. Since Sung teaches the same steps as the claimed invention, Sung's step of depositing a conductive metal layer 50, metal layers 46 and 48/stack of non-transparent layers on the metal surface and portion of dielectric layer 42/second dielectric layer would inherently resulting in an

Regarding claim 3, fig. 5 of Sung shows a structure includes an insulator between two metal layers

Regarding claims 4, 5, Sung discloses using CVD to form the dielectric layers (col 5, lines 52-54)

Regarding claim 6, Sung discloses etching the openings (col 5, lines 56-57)

Regarding claims 7, 8, Sung discloses using silicon oxide/ low constant dielectric material in the first dielectric layer 32 (col 4, lines 8-10)

Regarding claim 9, Sung discloses filling the opening with copper (col 6, lines 16-17)

Regarding claims 10-12, Sung discloses depositing liner layer 52 of tantalum nitride/tungsten nitride into the openings 56 and 57 (col 6, lines 13-30) and forming metal layer 44 on liner layer 52 (col 5, lines 13-15, fig. 6)

Regarding claims 14, 15, fig. 3 and 4 of Sung shows that the first line is etched in the dielectric layer 42 to a depth that is less than the depth of the top surface of metal layer 34, and the second line is etched to a depth coplanar to the top of metal layer 34

Regarding claim 16, fig. 6 of Sung shows the opening 57 having the width is greater than two time the depth of the opening.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sung et al (US 6,346,454) in view of Durlam et al (US 6,174,737)

Sung method has been described above. Unlike the instant claimed invention as per claim 2, Sung does not disclose forming a MRAM device.

Durlam disclose a method for fabricating MRAM (Magnetoresistive random access memory) includes memory element (col 1, lines 36-37)

Since Sung discloses forming a metal electrode capacitor, one skilled in the art would have found it obvious to employ Sung method for producing a MRAM in view of Durlam teaching because Sung discloses that capacitor are used for storage in memory cells (col 1, lines 18-20)

11. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sung et al (US 6,346,454) in view of Fu (US 6,183,614)

Sung method has been described above. Unlike the instant claimed invention as per claim 13, Sung does not disclose the specific thickness of the metal (copper) layer.

However, Fu, in a method of depositing metal, teaches that the thickness of the copper layer is a variable (col 3, lines 3-5)

Hence, one skilled in the art would have found it obvious to modify Sung by discovering the optimum values for the thickness of the copper layer because Fu discloses that the thickness of a metal layer is a variable in the same field of endeavor.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.



LV
June 8, 2003